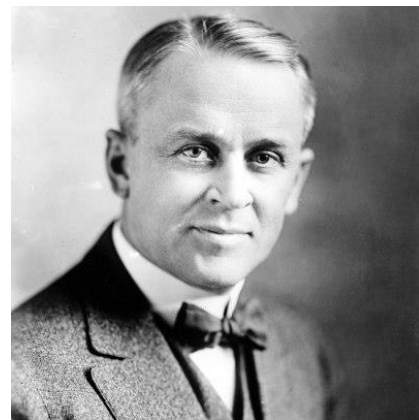


Spring 2017

Physics 357
Intermediate Physics Lab
Syllabus



Robert A. Millikan

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Course website:
<http://facultyweb.cortland.edu/douglas.armstead/S16/Intermediate.html>

Class: Tu and Th 8:30 – 11:20 Bowers 139

Office Hours: Tuesday and Thursday 2 – 3pm, Wednesday 10-11am, otherwise by appointment

Required texts:

- *Physics 357 Laboratory Manual*, Aphrodite Ahmadi and Richard Wheeler, 2017 edition, unpublished. *Will be distributed for free on course website.*
- *Foundations and Applications of Statistics*, Randall Pruim ISBN: 9780821852330.

Attendance Policy: Attendance in the laboratory is mandatory. Four or more unexcused classes (or two experiments) *will be grounds for failing the course.*

Complementary Courses: This laboratory complements Physics 203 and 410. Both are useful but neither is a requirement.

Grading:

Student Grades will be tallied as follows:

Introduction to error analysis and statistics	5 %
Laboratory Four	5 %
Papers from Seven Advanced Laboratories	60%
Two Lab notebook inspections	10%
Two Laboratories Re-writes	10%
Two In-class Presentations	10%

- The papers you write based on your time in the laboratory should pose and answer a question and that answer should be justified using statistics. You will need to be judicious in choosing your question and I strongly recommend that you consider what that question will be before you start your experiment, and that you double check that the question with me before you write your paper.
- You will submit the paper for the experiment(s) in class at the beginning of the following experiment on a Tuesday, *as well as* email me a pdf copy. The format will be similar to the format of a scientific paper. It will have the following sections:
 - Abstract: A very short explanation of what you did,
 - Introduction,
 - Multiple discussions sections that include procedures, data acquisition, calculations and the results.
 - And finally the Conclusion.

The titles of the sections and subsections can be anything you feel is descriptive of the content except the Introduction and the Conclusion, both of which *must* be labeled as such. The Abstract may or may not be labeled.

- The paper should stand on its own and be readable by any physics student at your level. A few important considerations include:
 1. present the data with appropriate units and all applicable calculations
 2. necessary graphs should follow the calculations and should be done in R, Excel or similar programs
 3. graphical analysis should be used to do regression analysis of data and error analyses should be made for *every* calculated quantity, and
 4. conclusions should be drawn and should be clearly supported by your experimental results.

I will provide a more detailed list of expectations in class and will post on the course website a sample of a real physics paper to follow. The quality of your reports will be taken VERY seriously by this grader. More papers may be found in the preprints archives: <http://arxiv.org/>

- This course is a writing intensive course, this means that you must receive feedback that you can act on at least twice during the semester. This can take one of two forms:
 1. On two of your lab reports write the paper, get it back graded, rewrite a new draft of the paper based on the feedback and turn this new draft in for a grade.
 2. On one of your lab reports go through two feedback iterations.

In either case what is important is that you show significant improvement from one graded draft to the next.

The presentations will be ten minutes long. We will follow standard conference formality. Dress semi-casual or formal (no shorts, flipflops or the like) and address your audience as if you have never met them before in your life and they have no idea what you did. You may choose your favorite medium (blackboard, PowerPoint slides, pdf's made out of your written lab reports' files etc. Each choice has its pros and cons – talk to me if you are unsure). You will be graded based on many factors, including but not restricted to: the clarity of your discussion, the accuracy of your work, your ability to engage your audience etc.

Syllabus:

1a Data Distributions

1b Goodness of Fit

1c Method of Least Squares

4 Wave Motion

5 Speed of Light

6 Light and the Laser

7 Properties of Lenses

9 Viscosity

10 Franck-Hertz
Experiment

11 Microwave Optics

12 Three Thermodynamics Experiments

13 Millikan Oil Experiment

14 e/M Ratio for the Electron

15 Meteor craters

The Schedule: (Please arrive prepared and read ahead. You may use your laptop in class)

Date	Experiment Number		
	<i>Group Meter</i>	<i>Group Kilogram</i>	<i>Group Second</i>
Jan. 24, 26	1a, 1b	1a, 1b	1a, 1b
Jan. 31, Feb 2	1b, 1c	1b, 1c	1b, 1c
Feb. 7, 9	4	4	4
Feb. 14, 16	5	One of three (6, 7, 11)	One of three (6, 7, 11)
Feb. 21, 23	One of three (6, 7, 11)	One of three (6, 7, 11)	5
Feb. 28, Mar. 2	One of three (6, 7, 11)	5	One of three (6, 7, 11)
Mar. 7, 9	<i>Completion of Inquiry Based Extension for Last Lab / Prep for In-Class Presentations</i>		
	<i>First Re-write Due.</i>		
Mar. 14, 16	<i>Spring Break - No class</i>		
Mar. 21, 23	<i>In-Class Presentations of chosen Lab</i>		
Mar. 28, 30	12	12	12
Apr. 4, 6	One of three (Viscosity, Sterling Engine, Peltier)	One of three (Viscosity, Sterling Engine, Peltier)	One of three (Viscosity, Sterling Engine, Peltier)
Apr. 11, 13	One of three (Viscosity, Sterling Engine, Peltier)	One of three (Viscosity, Sterling Engine, Peltier)	One of three (Viscosity, Sterling Engine, Peltier)
Apr. 18, 20	One of four (Frank Hertz, Millikan Oil, e/m ratio, Meteor Crater)	One of four (Frank Hertz, Millikan Oil, e/m ratio, Meteor Crater)	One of four (Frank Hertz, Millikan Oil, e/m ratio, Meteor Crater)
Apr. 25, 27	One of four (Frank Hertz, Millikan Oil, e/m ratio, Meteor Crater)	One of four (Frank Hertz, Millikan Oil, e/m ratio, Meteor Crater)	One of four (Frank Hertz, Millikan Oil, e/m ratio, Meteor Crater)
May 2, 4	One of four (Frank Hertz, Millikan Oil, e/m ratio, Meteor Crater)	One of four (Frank Hertz, Millikan Oil, e/m ratio, Meteor Crater)	One of four (Frank Hertz, Millikan Oil, e/m ratio, Meteor Crater)
	Second Re-Write Due.		
May 8 8-10am	<i>In-Class Presentations of chosen Lab</i>		